AMPGARD® STARTERS

HIGH VOLTAGE (25L4 AND 50L4) NEMA CLASS E2

DESCRIPTION

APPLICATION

The Westinghouse Ampgard is a high voltage starter designed for starting and controlling AC motors with horsepower and voltage ratings as indicated in the Rating Table below. Check Table and starter nameplate against motor nameplate and power system.

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, checkout, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

ENCLOSURE

Ampgard starters are supplied in a basic NEMA 1 steel floor mounted enclosure that is 36" wide x 30" deep x 90" high. A 10" high main bus enclosure can be added at the top which increases the total enclosure height to 100". Each basic 90" high enclosure can accommodate one or two Ampgard starters depending on the requirements.

INSTALLATION

Prepare a level mounting per standard floor plan (Fig. 2) or per special drawings supplied separately. Installation procedures are specified on 6379D27H01, a copy of which is supplied with this leaflet. These recommended procedures will save you time if you follow them. In general, the cable connections can be made by access through the front of the enclosure. Alternatively, where there is access space behind the installation, the rear panel of the enclosure can be removed in order to facilitate the wiring. Adequate space has been provided near the left hand enclosure wall for high voltage line and load cables while low voltage cables may be conveniently arranged near the right hand enclosure wall.

MECHANICAL INTERLOCKS

BEFORE PUTTING THE STARTER INTO SERVICE, IT IS RECOMMENDED THAT THE USE BECOME FAMILIAR WITH THE MECHANICAL INTERLOCKS.

GENERAL

Ampgard starters use the type LF50H430 contactor, Type 50LFR4 Isolating Switch and current limiting motor starting fuses. These major components are arranged as shown in Fig. 3 where the starter is shown in the de-energized position. Type LFC or through type current transformers are mounted on the L.H. enclosure wall.

	Starter Type	Voltage	Freq. Cyc.	Contactor 8-Hour Enclosed Rating (Amperes)	Symmetrical 3 Phase Available Short Circuit Capacity in KVA	Horsepower Rating		
						Synchronous		Induction Motor
						100% P.F.	80% P.F.	
*	Ampgard 25L4	2200-2500	50-60	360	200,000	1750	1500	1500
*	Ampgard 50L4	4000-5000	50-60	360	350,000	3000	2500	2500

* The Isolating Switch is NOT load break nor load make. It is to be operated only when the line contactor is open. Mechanical Interlocking is intended to prevent manually opening or closing a power load. Do not connect auxiliary control devices to the control circuits to exceed max. total control burden of 750 VA at 2500 volts or 600 VA at 5000 volts.

Fig. 1. Rating Table

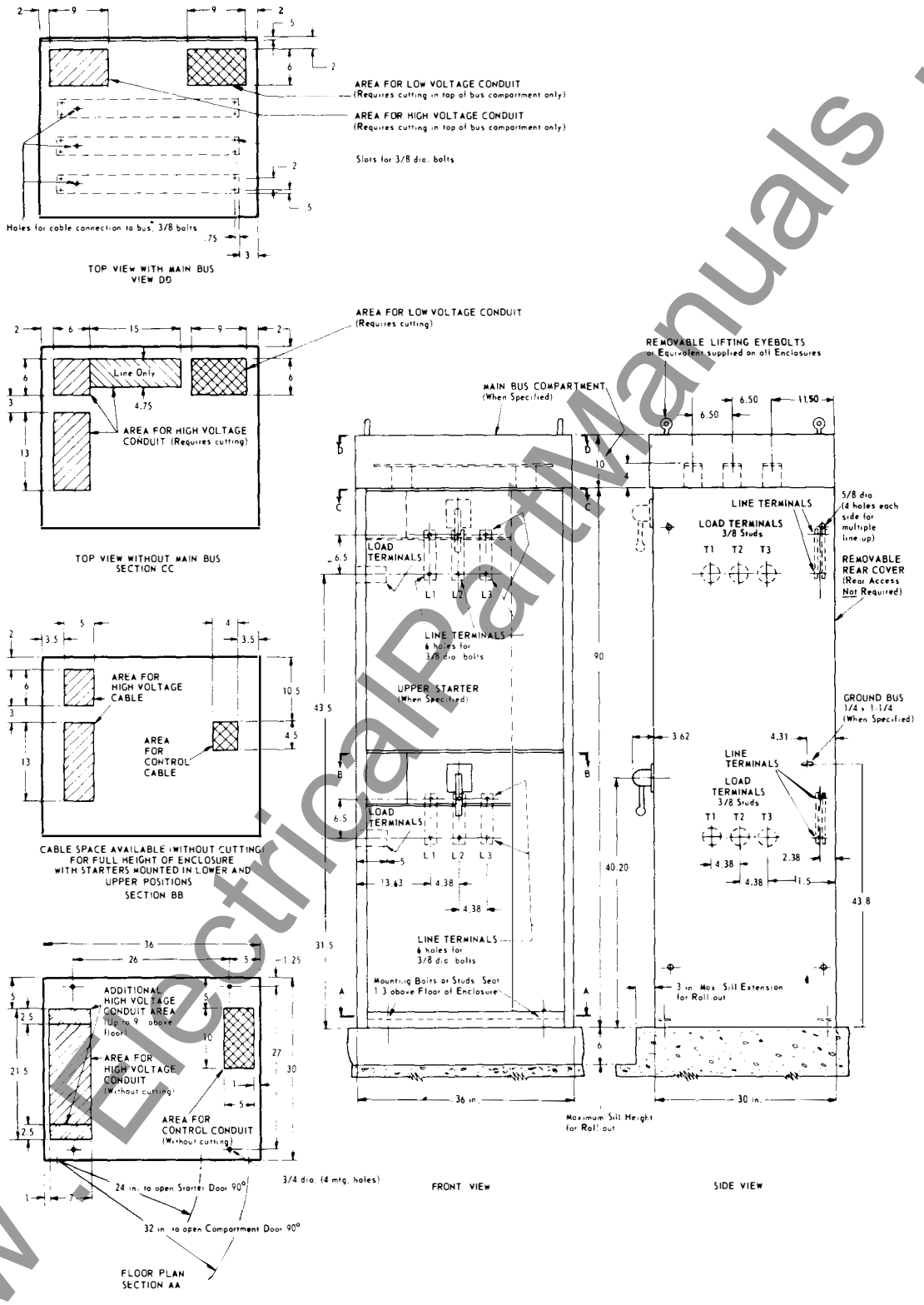

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Fig. 2. Mounting and Installation Dimensions of Standard Ampgard Starters

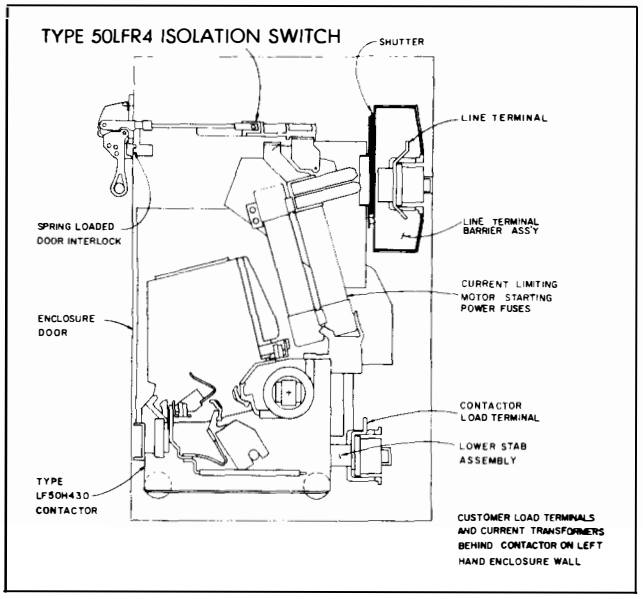

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Fig. 3. Starter in De-energized Position

The flow of power through the starter can be traced by referring to Fig. 4, where the starter is shown in the energized position. The line stab assembly mounted at the back of the enclosure also serves as the starter line terminals (1). The stabs themselves are engaged by the fuse jaws (2) of the isolating switch which is mounted on rails at the top of the enclosure. The line ferrules (3) of the current limiting motor starting power fuses (4), clip into the fuse jaws, and the load ferrules (5) fit into the fuse holders (6) which are part of the contactor line terminals. Power flow through the contactor is from the load ferrules of the power fuses, through the electromagnetic blowout coils (7), contacts (8), and shunts (9), to the contactor load terminals (10). The contactor is mounted on rails in the lower part of the enclosure, immediately adjacent to the current transformers, which are bolted to a panel on the side of the enclosure.

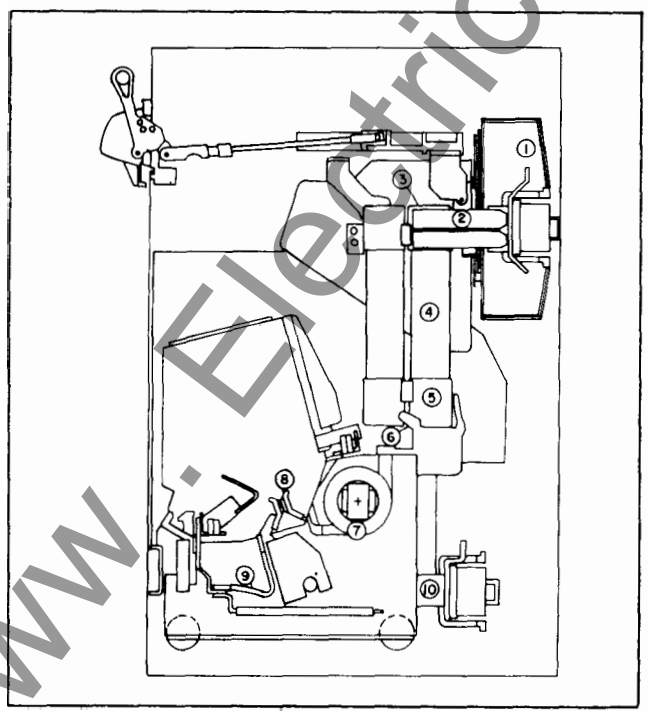

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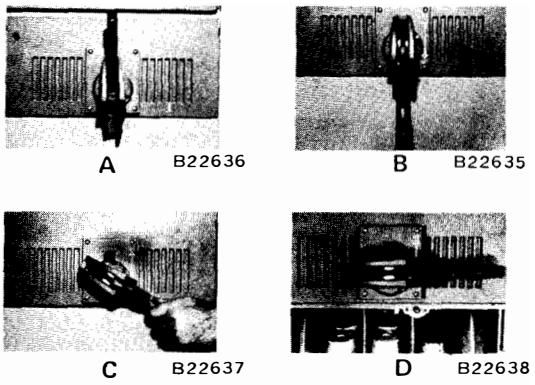
Fig. 4. Starter in Energized Position

Spring loaded contact jaws mounted on the contactor load terminals plug into the lower stab assembly, providing a convenient connection through the current transformers to the motor load terminals mounted on the L.H. side wall of the enclosure (Fig. 2).

Isolating Switch Handle (Fig. 5). The starter is shipped with the isolating switch in the ON position. The isolating switch handle is operated by moving it through a vertical arc from the ON to the OFF position. From the OFF position, it can be rotated 90° counterclockwise to the HORIZONTAL position, the door open position.

In both the ON and OFF positions, a portion of the handle housing extends over the high voltage door preventing the high voltage door from being opened. To open this door, the handle must be moved to the HORIZONTAL position.



The operating handle has three distinct positions.

In the ON position (A), the isolating switch is closed, the high voltage door is interlocked shut and the starter may be energized.

In the OFF position (B), the isolating switch is open, the high voltage door is interlocked shut and the starter is de-energized and grounded.

With the handle rotated 90° counterclockwise (C) to the HORIZONTAL position (D), the isolating switch is open, the starter is de-energized, and the high voltage door may be opened.

Fig. 5. Isolating Switch Handle Operation

With the handle in the OFF position, up to three padlocks can be used to lock the switch, preventing the handle from being moved to either the ON or the HORIZONTAL position. This prevents both unauthorized entry into the high voltage compartment and accidental closing of the isolating switch while maintenance work is being done. From the HORIZONTAL position, the handle cannot be moved to the ON position, without first moving to the OFF position.

Door Interlock. With the isolating switch handle in the HORIZONTAL position, the high voltage door can be opened. As soon as the door opens, a mechanical interlock becomes effective. It is designed to prevent the user from accidentally operating the isolating switch handle and closing the starter on to the line with the high voltage door open.

This interlock is a spring loaded plunger located just below the handle housing (Fig. 5D). This prevents the handle from being accidentally returned to the OFF position. This interlock may be deliberately cheated by depressing the plunger with a screwdriver so that the handle can be moved to the OFF position to observe the operation of the isolating switch during installation or maintenance. To do this, it is necessary to deliberately cheat the interlock. The handle must be returned to the HORIZONTAL position by again depressing the interlock plunger before the high voltage door can be closed. The operator must be aware of what he is doing and take appropriate safety precautions.

Contactor to Isolating Switch Mechanical Interlock (Fig. 6). The Type 50LFR4 Isolating Switch functions only as a disconnect; it must never close, or interrupt a power load. To prevent this, the interference lever roller (30) on the contactor is engaged by a cam (24) on the isolating switch. If the contactor is closed, the isolating switch cannot be moved either from the OFF to the ON, or from the ON to the OFF positions. This is a positive interlock, it cannot be cheated without disassembly of the interlocking parts.

Line Stab Insulating Shutter. Both the shutter and the rear line stab barrier are mounted in the starter structure and are intended to prevent accidental access to the line bus. As the isolating switch is opened, the molded cam surface of the sliding tray mechanically drives the insulating shutter closed across the three line stab openings in the rear barrier. As the shutter closes the openings, green and white striped labels are uncovered to visually indicate that the shutter is closed. With the isolating switch in the full open position, the fuse jaw finger assemblies and the line side of the main fuses are connected to the ground bar.

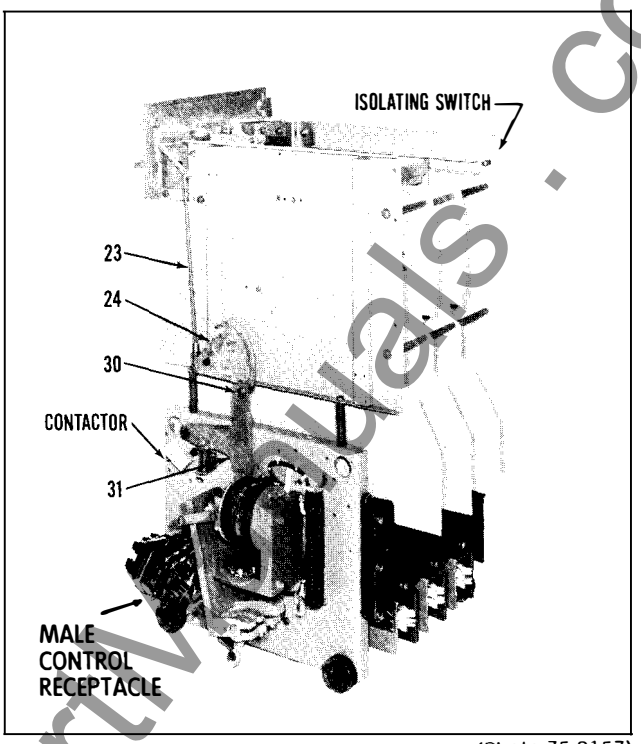


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Fig. 6 50LFR4 Isolating Switch and Type LF50H430 Contactor

As a final precaution before touching any of the electrical parts of the starter, visually check to make certain that the shutter is closed, the green and white striped labels are visible, the grounding fingers are in contact with the ground bar, and the tips of the fuse fingers are visible.

When the isolating switch is removed from the starter structure, a latch lever on the shutter assembly is activated. It is designed to hold the insulating shutter closed. This latch may be deliberately cheated and the shutter moved to the open position. CAUTION should be observed since the exposed line terminal stabs of the starter may be energized at line potential.

When the isolating switch is replaced in the structure, the latch member is automatically released to allow the shutter to operate normally.

CONTROL PANEL AND LOW VOLTAGE COMPONENTS

The low voltage components comprising the interposing relay, protective relays and rectifier, are mounted on a fixed panel. The control power transformer, nominally rated at 750 VA up thru 2500 volts, 600 VA from 2501 to 5000 volts, single phase, is bolted to the L.H. contactor frame. The primary of the control transformer is connected to the line through the current limiting motor starting fuse assembly, and is protected by two additional low rating current limiting fuses

mounted in insulating fuse blocks located above the transformer. The secondary of the control transformer supplies power to the 115 volt ungrounded control circuit through 115 volt, 10-ampere fuses mounted on the right hand contactor frame. When specified, control transformers with 230 volts secondaries can be supplied.

To energize the primary of the control transformer, the contactor must be pushed into the enclosure to the latched position, the main power fuses must be installed, and the isolating switch must be closed on to the line.

Test-Run Plug. For convenience during maintenance, when it may be desirable to energize the contactor or the control circuit, a control plug is provided. WITH THE ISOLATING SWITCH OPEN, disconnect the plug from the socket, (under the control transformer on the contactor), and plug it into a 60 cycle, 115 volt single phase extension cord or 230 volt when specified. Special plugs may be provided when specified by the user.

Disconnect this temporary circuit and restore the plug to its socket on the contactor before returning unit to service.

SHORT CIRCUIT AND OVERLOAD PROTECTION

Electrical protection is provided by the current limiting motor starting power fuses and by the overload relay. The current limiting motor starting power fuses have a special time/current characteristic for motor service, and this characteristic is coordinated with the characteristic of the overload relay. Currents greater than full load motor current, up through locked rotor current, will operate the overload relay and trip the contactor before the fuses blow. This prevents unnecessary blowing of the fuses. Since the interrupting capacity of the contactor is 50,000 KVA, the power fuses must operate faster than the overload relay when the current corresponding to 50,000 KVA exceeds this value, in order to prevent damage to the starter or motor. In all faults above 50,000 KVA and within the rating of the equipment, the current limiting motor starting fuses will operate first.

The current transformers, overload relay heaters, and power fuses are coordinated with the motor characteristics, so that the starter must be used with the motor for which it was designed. Motors with special characteristics or loads requiring special protection often require other or additional protective relays. Consult the instruction leaflet for that particular protective relay before attempting any adjustment or service.

START-UP PRECAUTIONS

Before attempting to put a newly installed starter into service, study the wiring diagram and available instruction literature.

General Precautions. Be sure that:

1) The corresponding starter and motor are connected as shown on the Westinghouse drawings. This is particularly essential in this class of motor starter as the fuse ratings, current transformers, and overload heater elements are based on the characteristics of the particular motor to be controlled.

2) The starter is connected to a suitable power supply with characteristics agreeing with motor and starter nameplate markings.

3) The motor and machine it drives are properly lined up, bolted down, lubricated, free of obstructions, and ready to go.

4) Connections are neat, tight, of proper capacity and in agreement with the diagram.

5) Equipment has been cleaned of dirt, scraps of wire, tools, and all other foreign material.

6) THE INSULATION LEVEL OF THE STARTER SHOULD BE CHECKED BEFORE THE STARTER IS ENERGIZED. Refer to maintenance and repair section for additional information regarding the checking of insulation level.

7) All possible safety precautions have been taken and the installation conforms with applicable regulations and safety practices.

Isolating Switch. Be sure that:

1) The main current limiting motor starting power fuses have been properly installed. See the permanent operating instructions on the inside of the high voltage door.

2) The mechanical interlocking system operates freely, is properly adjusted, and will operate to provide the intended protection.

Contactor. Be sure that:

1) The blowout iron is forward and down. If the arc boxes won't go into place the blowout iron is probably in the wrong position.

2) The arc boxes are in the operating position. Push them firmly into place to be sure that the front knife blades engage and deflect the knife jaws mounted adjacent to the main contacts.

3) THE FOUR CONTACTOR PHASE BARRIERS ARE INSTALLED.

4) The drawout latch, located on L.H. contactor end plate, is positioned behind the stop bracket mounted on L.H. contactor rail.

5) The magnet armature and moving contact system move freely.

Control Circuit. Be sure that:

1) The high voltage and low voltage control fuses are properly installed.

2) The female low voltage, control plug, (on the right hand enclosure frame) has been pushed into the male control receptacle on the contactor.

3) The test-run plug is plugged into the socket mounted on the L.H. side of the contactor.

Close the high voltage door, the low voltage door, and then tighten the door latches. Move the isolating switch handle to the OFF position. The Ampgard starter is now ready for operation.

MAINTENANCE AND REPAIR

GENERAL

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, checkout, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

Ampgard starters should be operated by authorized personnel only. Personnel authorized to operate the isolating switch and those authorized to inspect, adjust, or replace equipment inside the enclosure should have a complete understanding of the operation of the starter, and must have thorough training in the safety precautions to be followed when working with high voltage equipment.

A maintenance program should be established as soon as the starter has been installed and put into operation. After the starter has been inspected a number of times at monthly intervals and the conditions noted, the frequency of inspection can be increased or decreased to suit the conditions found, since this will depend upon the severity of the duty.

Before attempting maintenance, consult the specific diagram and the general and specific device instruction leaflets. These are listed at the end of this leaflet.

Insulation Level. After installation, and before energizing the starter for the first time, the insulation resistance between poles and from each pole to ground should be measured and recorded. It is not practical to specify an absolute value for this reading since it is dependent on other connected apparatus and conditions of service. However, any unusually low reading or abrupt reduction in a reading when compared to original readings would indicate a possible source of trouble, and the cause should be determined and corrected.

Fuses (See Fig. 7). The current limiting motor starting fuses should be inspected after each fault-clearing operation, since this is the most severe service to which they will be subjected. Visual indication of a blown fuse is provided by an indicator in the top of the fuse. This indicator pops up and is visible over the top of the contactor arc chutes when the fuse is blown.

Blown fuses may be removed and replaced by using the fuse puller provided. The isolating switch handle must be horizontal before attempting to remove or replace any fuse.

The correct procedure for replacing fuses is described on the instruction sheet (NP 160P323H01) which is permanently fastened inside the door. This instruction sheet also lists the correct fuse rating and fuse part number for that particular starter. Starting in 1975, some fuses have "R" designations. The continuous amp rating indicated may be the same or higher than older fuses without "R" designations. In this case, replace by identical part number, disregarding the amp rating.

If for any reason, there is doubt about the condition of a fuse, a simple test is to check its electrical continuity.

Contactor. WITH ISOLATING SWITCH HANDLE horizontal, the Type LF Contactor contacts can be examined by simply pulling the arc chutes

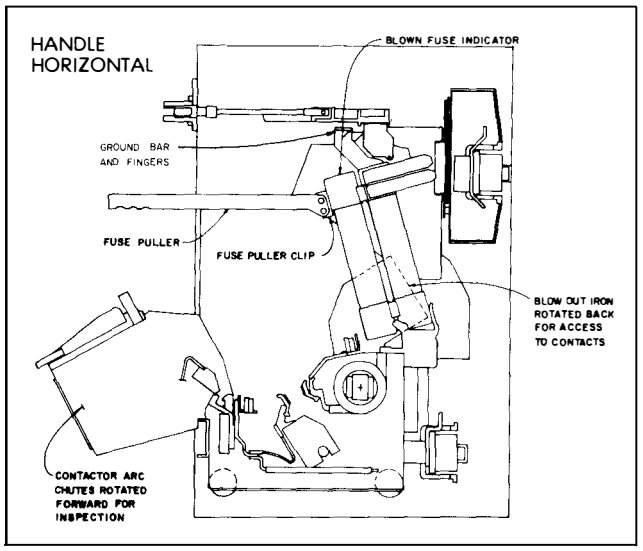

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Fig. 7. Fuse Removal & Replacement

forward to rotate them out of the operating position (Fig. 7). To make a more detailed examination, to replace contacts, or to carry out any maintenance work, the contactor can be withdrawn from the enclosure to a drawout position. To do this:

1) Rotate the arc boxes forward and then remove the current limiting motor starting power fuses.

2) Rotate the arc boxes back into the operating position and then remove all four phase barriers by lifting slightly, pulling forward, and then rotating the top outwards.

3) LIFT the contactor latch on the left hand side of the contactor, grip the contactor and pull sharply to free the contactor from the stab connectors at the back.

4) **Carefully** slide the contactor out to the detent position.

   It will again be stopped by the contactor latch (located at the front lower left corner of the contactor) about ¾ of the way out.

In this drawout position, all routine maintenance can be carried out. For major overhaul, the contactor can be completely removed from the enclosure by taking two more steps:

5) Remove the female multi-point low voltage control plug from R.H. side of the contactor.

6) Press down the contactor stop latch, and roll the contactor out of the enclosure onto the floor, or in the case of an upper unit onto a fork truck or other suitable platform of the right height.

TYPE 50LFR4 ISOLATING SWITCH

Removal. Any maintenance beyond visual examination should be carried out with the switch removed from the enclosure. This will avoid the possible hazard of closing the switch on to an energized line when the door mechanical interlock has been defeated manually.

To remove the isolating switch from the enclosure:

1) Open the isolating switch and rotate the handle to the HORIZONTAL position. Open the high voltage door.

2) Remove the current limiting motor starting power fuses and the four contactor phase barriers.

3) Remove the Type LF Contactor.

4) Remove the two bolts located in each top corner of the isolating switch front casting. Disconnect leads to Auxiliary Switch Terminal block (if used).

5) Slide the isolation switch out of the enclosure.

6) Refer to IL 16-200-23 for examination, lubrication and adjustment procedure.

Opening the High Voltage Door Under Abnormal Conditions. In the unlikely event that either the isolating switch fuse jaws or the contactor contacts should weld closed, or if an event should occur so that the isolating switch handle cannot be moved from the ON to the OFF position, provision has been made so that the high voltage door can be opened in an emergency. The door can be opened by using the following procedure:

1) MAKE SURE THAT THE MAIN INCOMING POWER LINE IS DEENERGIZED, to avoid a hazardous situation when the high voltage door is opened.

2) Remove the four slotted screws holding the rectangular handle housing of the isolating switch to the front casting.

3) The complete handle housing can now be pushed up far enough to provide clearance for opening the door. Maintenance may be carried out as required.

LUBRICATION

Periodically, apply a light coating of Dow Corning DC-4 high temperature silicone grease (or equivalent) to the tips of the fuse jaw fingers where they engage the line terminal stabs. Also clean and lubricate the tray guide rails and the rollers above and below the clevis.

LIST OF PUBLICATIONS APPLYING TO DEVICES
USED IN THESE STARTERS

Device	Instruction Leaflet No.	Renewal Parts Data No.
Type 50LFR4 Isolating Switch	IL 16-200-23A	50LFR4
Type LF-25H430 & LF-50H430 Contactors	IL 16-200-25	16-200A3
Slipsyn Synchronous Motor Control	IL 14-000-1B	
Ampgard Installation Instructions	6379D27H01	

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